

a thrust plate and a thrust plate supporter securely coupling said thrust plate to said base plate;

a thrust bearing securely coupled to said rotating assembly, wherein said thrust bearing is shaped complementary with said thrust plate and spaced apart therefrom to form a second clearance gap, said thrust bearing being separate from radial bearing, and a gas fluid situated within said second clearance gap for providing at least axial stiffness for said rotatable assembly;

a stator for causing the rotation of said rotatable assembly;

a magnetic device operated by an electrical current for moving said rotatable assembly away from said base plate substantially along said rotational axis so that said rotatable assembly is less supported by said base plate during rotation of said rotating assembly, said magnetic device including a stator lamination with coil securely coupled to said thrust plate supporter and a magnetic plate securely coupled to said rotatable assembly, and

a magnetic preloading means including a permanent magnet mounted to said magnetic plate to urge said separate thrust bearing into a rotatable assembly stop position for preventing free movement of said rotatable assembly when said current is not supplied to said magnetic device.

7. (Amended) The electric spindle motor of claim 4, further including upper and lower liquid absorbers situated proximate respective upper and lower magnetic seals for absorbing said liquid fluid if it leaks.

REMARKS

Applicant submits an amended claim 1 which is believed to distinguish over the art along with its novel and patentable dependent claims 4-8 which will be discussed herein.

Applicant's present invention in a magnetic preloading means involves its cooperation with an electric spindle motor of the type having separate thrust and radial bearings. Neither of the cited references Kataoka et al. or Stahl et al. suggest an arrangement of separate thrust and radial bearings within which to provide both a magnetic device for operating by electric current for moving the rotatable assembly away from the base plate and the particular in applicant as now presented in claim 1 for the defined magnetic preloading means which includes a permanent magnet mounted to the magnetic plate of the magnetic device to urge the separate thrust bearing into a rotatable assembly stop position. The disclosure of separate thrust and radial bearings *per*

se is shown in the US Patent No. 5,969,448, submitted via a supplemental information disclosure statement herewith, which does not address the issues of a magnetic preloading means.

Twice amended claim 1 sets up the separate thrust and radial bearing arrangement as well as structure of the thrust bearing including the thrust supporter, supporter 30 in the exemplary embodiment. The magnetic device is recited as cooperating with the thrust bearing by incorporating a stator lamination with coils securely coupled to the thrust bearing supporter and a magnetic plate coupled to the rotatable assembly. Applicant's novel arrangement of permanent magnet of the preloading means includes a permanent magnet mounted to the magnetic plate in order to urge the separate thrust bearing into a rotatable assembly stop position when current is not supplied to the magnetic device. It is respectfully submitted that this construction and mode of operation of stopping the rotatable assembly through urging the thrust bearing into a stop position is not disclosed nor suggested in the prior art. It is requested that consideration be given to applicant's dependant claim 4 for disclosing a novel arrangement of at least one magnetic seal to reduce leaking of the liquid fluid from the first clearance gap and wherein at least one magnetic seal comprises upper and lower magnetic seals to reduce leaking of the liquid between an upper end of the sleeve and the shaft and a lower end of the sleeve and shaft. This magnetic seal is believed to be both novel and patentable in the environment of applicant's claim 1.

Claim 5 adds to claim 4 the sealing ring disposed proximate an end of the sleeve and in contact with a perimeter surface of the shaft when a ferrofluid gap exists between the sealing ring and the shaft to receive a ferrofluid. A magnetic structure disposed proximate the sealing ring is provided to hold ferrofluid within the ferrofluid gap and the magnetic structure includes a magnetic ring situated around the sealing ring. The subject matter of this claim is believed to be novel and patentable in the environment of its parent claims 1 and 4.

Claim 6 adds to the electric spindle motor of claim 5 the feature of the ferrofluid gap being formed by a recess in the sealing ring and in addition wherein the ferrofluid gap is formed between a wedge shaped inner surface of said sealing ring and said shaft. It is respectfully submitted that construction for the ferrofluid gap is novel and patentable in the environment of its parent claims 1, 4 and 5.

The dependency of claim 7 has been corrected to be dependent upon claim 4 in order to give antecedent basis to the upper and lower magnetic seals recited in the claim, and which are recited in claim 4. Claim 7 adds upper and lower liquid absorbers situation proximate respective

upper and lower magnetic seals for absorbing the liquid fluid if it leaks. This construction and mode of operation is respectfully submitted as being novel in the environment of its parent claims 1 and 4.

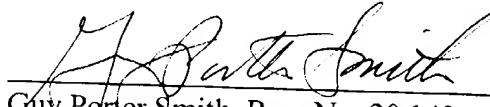
Claim 8 defines the electric spindle motor of claim 4 wherein the magnetic seal provides an electrical path for discharging static charges from a surface of a disk disposed on said rotatable assembly. This construction and mode of operation is believed to be both novel and patentable within the environment of the parent claims 4 and 1.

Reconsideration and allowance of all claims 1 and 4-8 submitted is respectfully requested.

Applicant requests a 3 month extension of time to respond to the office action of August 23, 2002. The Commissioner is hereby authorized to charge any filing fees under 37 C.F.R. § 1.16, or application processing fees under 37 C.F.R. § 1.17, which may be required now or during the pendency of this application, or credit any overpayment to Account No. 16-2230.

Respectfully submitted,

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MARKED UP CLAIMS TO SHOW CHANGES

1. (Twice Amended) An electric spindle motor having a thrust bearing separate from a radial bearing, comprising:

a base plate;

a rotatable assembly including a rotatable sleeve extending substantially perpendicular from said base plate along a rotational axis, wherein said rotatable assembly is supported by said base plate;

a radial bearing including a stationary shaft securely coupled to said base plate, and extending within said sleeve along said rotational axis and spaced therefrom to define a first clearance gap[;] and a liquid situated within said first clearance gap for providing at least radial stiffness for said rotatable sleeve;

a thrust plate and a thrust plate supporter securely [coupled] coupling said thrust plate to said base plate;

a thrust bearing securely coupled to said rotating assembly, wherein said thrust bearing is shaped complementary with said thrust plate and spaced apart therefrom to form a second clearance gap, said thrust bearing being separate from radial bearing [;], and a gas fluid situated within said second clearance gap for providing at least axial stiffness for said rotatable assembly;

a stator for causing the rotation of said rotatable assembly;

a magnetic device operated by an electrical current for moving said rotatable assembly away from said base plate substantially along said rotational axis so that said rotatable assembly is less supported by said base plate during rotation of said rotating assembly, said magnetic device including a stator lamination with coil securely coupled to said thrust plate supporter and a magnetic plate securely coupled to said rotatable assembly, and

a magnetic preloading means including a permanent magnet mounted to said magnetic plate to urge said separate thrust bearing into a rotatable assembly stop position for

preventing free movement of said rotatable assembly when said current is not supplied to said magnetic device.

7. (Amended) The electric spindle motor of claim [1] 4, further including upper and lower liquid absorbers situated proximate respective upper and lower magnetic seals for absorbing said liquid fluid if it leaks.